

The Genus *Limnia* in California

(Diptera: Sciomyzidae)

T. W. FISHER AND R. E. ORTH

Department of Entomology, University of California, Riverside 92502

The genus *Limnia* Robineau-Desvoidy (1830: 684) can be distinguished from other sciomyzid genera by the following characters: propleural bristle lacking; vellar (subalar) bristles present; arista with whitish hairs or pubescence; mid-frontal stripe approximately $\frac{1}{3}$ width of frons; wings reticulated; black spot on medifacies lacking; tp (posterior crossvein) arcuate, only slightly sinuate.

As indicated by Steyskal (1965: 691), *Limnia* is in need of revision. Such a study is in progress jointly with G. C. Steyskal, L. V. Knutson (USNM), and the authors. Pursuant to compilation of a California Insect Survey Bulletin on the Sciomyzidae it has become necessary to clarify the status of the genus in this State. We recognize four species in California; *L. severa* Cresson (Cresson, 1920: 80), *L. inopa* (Adams) (Adams, 1904: 448), *L. pubescens* Day (Day, 1881: 86), and *L. boscii* (Robineau-Desvoidy) (R.-D., 1830: 690). The first three named are western North American in distribution. *Limnia boscii* is transcontinental between 35°–47°N Latitude. Both sexes of the species collected within California are easily separated by external characters. However, outside of California, examination of male terminalia is necessary for definitive determination of certain species. Structures such as the hypandrium, surstylus, and aedeagus are diagnostic for *L. inopa* and *L. severa* (Figs. 6–16).

The objectives of this paper are to (1) resurrect and redescribe *L. inopa* (Adams); (2) redescribe *L. severa* Cresson; (3) provide a key to the *Limnia* of California; and (4) summarize biological information for *Limnia* in California.

LIMNIA INOPA (Adams)

Tetanocera inopa Adams, 1904: 448. Holotype ♂; Washington Territory; Repository, University of Kansas.

Limnia costalis var. *brevicostalis* Melander 1920: 323.

Limnia brevicostalis Melander, Steyskal 1965: 691.

Limnia boscii (Robineau-Desvoidy) 1830: 690, Steyskal 1965: 691.

Examination of the types of *L. inopa* (Adams) (Adams, 1904: 448) and *L. brevicostalis* Melander (Melander, 1920: 323) plus a series of 75 specimens in

the UCR collection and 33 specimens from the collections of CAS, CU, CDA, KSU, KU, UCB, and USNM lead us to conclude a single taxon is involved.

Distribution: Alta., B.C., Calif., Idaho, Mont., Oreg., Wash.

Head.—Frons yellow, longer than wide, mid-frontal stripe $\frac{1}{4}$ to $\frac{1}{3}$ width of frons, usually widest in females; two frontal-orbital bristles present, anterior socket surrounded by velvety black coloration; ocellars and post-ocellars prominent and of nearly equal length, longer than fronto-orbitals; velvety black patch present in anterior corners of frons. Single velvety black patch present on occiput immediately posterad of post-ocellars. Face and gulae whitish; medifacies bare; parafacies with fine black hairs; central portion of medifacies sometimes with brown discoloration; face deeply concave. Palpi yellow. Eyes large, oval, distinctly longer than high. Antennae with arista with dense white short hairs, basal segments yellow and hirsute; third antennal segment yellowish, usually tinged with black anteriorly, hirsute; second antennal segment approximately same length as third, longer than high from lateral aspect, inflated ventrally, compressed dorsally in cross-section, highly polished, ochraceous yellow, usually with brownish area on dorsal half, usually with two strong bristles on dorso-apical half. Thorax with notum with two narrow brown vittae centrally, a pair of broader brown vittae laterally and a pair of smaller vittae appearing posterad, all separated by dull pruinosity; scutellar bristles prominent; prescutellar bristles variable, generally vestigial to half length of scutellum. Pleura pruinose; pro- and mesopleura brown in upper half. Prosternum without hairs. Legs yellow, tarsal segments 3, 4, and 5 (and sometimes 2) may be dark brown. Wings hyaline, with brown reticulations; posterior crossvein curved outwardly, may be slightly sinuate; halter pale yellow. Wing lengths of 20 females 4.3 to 6.0 mm (average 5.2 mm), 20 males 3.3 to 5.3 (average 4.6 mm).

Abdomen pruinose with irregularly defined brown vittae laterally. Post-abdomen as in Fig. 3.

LIMNIA SEVERA Cresson

Limnia severa Cresson, 1920: 80. Holotype ♂; Cayton, Shasta County, California; Repository, California Academy of Science.

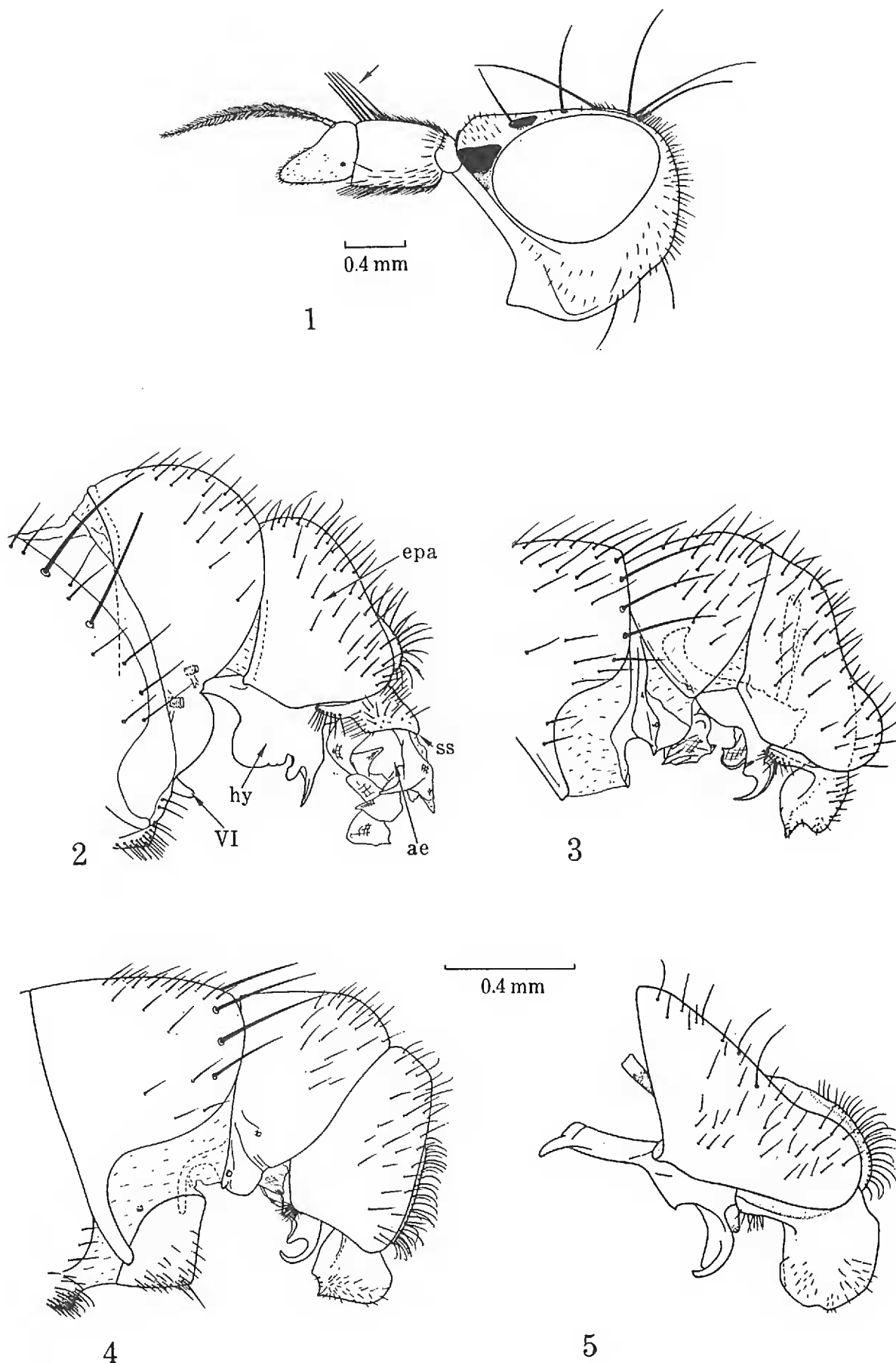
Limnia unguicornis var. *severa* Cresson 1920: 80.

Limnia saratogensis var. *severa*, Melander 1920: 324.

Limnia saratogensis var. *armipes* Melander 1920: 324.

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FIGS. 1-5. Fig. 1. *Limnia pubescens* (Day). Head, male. USA, Calif., Shasta Co., Cayton; Elev. 3,050 ft.; VII-25-1972; T. W. Fisher and R. E. Orth, collectors. Arrow indicates strong diagnostic bristles on the anterior dorsal edge on the second antennal segment. Figs. 2-5. Postabdomen, sinistral view; ae, aedeagus; ep, epandrium; hy, hypandrium; ss, surstylus; VI, ventral projection of 6th sternite or protandrium. Fig. 2. *Limnia bosicii* (R.-D.). USA, Calif., Mono Co., Fish Slough; Elev. 4,250 ft.; IX-7-1967; T. W. Fisher and R. E. Orth. Fig. 3. *Limnia inopa* (Adams). USA, Calif., Modoc Co., East of Cedar Pass; Elev. 5,800



ft.; VIII-24-1967; T. W. Fisher and R. E. Orth. Fig. 4. *Limnia severa* Cresson. USA, Calif., Alpine Co., south of Woodfords; Elev. 6,000 ft.; VII-11-1968; T. W. Fisher and R. E. Orth. Fig. 5. *Limnia pubescens* (Day). USA, Calif., Shasta Co., Cayton; Elev. 3,050 ft.; VII-25-1972; T. W. Fisher and R. E. Orth.

Limnia armipes, Steyskal 1965: 691.

Limnia severa, Steyskal 1965: 692; Fisher & Orth 1971: 164.

Distribution: B.C., Ariz., Calif., Colo., Oreg., Wash.

Head.—Frons yellow to testaceous, length and width nearly equal, mid-frontal stripe approximately $\frac{1}{4}$ width of frons; two fronto-orbital bristles present, anterior socket surrounded by velvety black coloration, posterior socket to a lesser degree; ocellars and post-ocellars prominent and of nearly equal length, longer than fronto-orbitals; velvety black patch present in anterior corners of frons; single velvety black patch present on occiput immediately posterad of post-ocellars. Face and gulae whitish; medifacies bare; parafacies with fine back hairs; central portion of medifacies sometimes with yellow to brownish discoloration; face moderately concave. Palpi yellow. Eyes large, oval, distinctly longer than high. Antennae with arista with moderately short and dense hairs, basal segments yellow and hirsute; third antennal segment yellowish, tinged with black anteriorly, hirsute; second antennal segment approximately same length as third; longer than high from lateral aspect; polished, ochraceous yellow, usually with brownish area on dorsal $\frac{1}{3}$ to $\frac{1}{2}$; usually with two strong bristles on dorso-apical half. Thorax with notum with two narrow brown vittae centrally, a pair of broader brown vittae laterad, and a pair of additional smaller vittae appearing posterad, all separated by dull pruinosity; scutellar bristles prominent; prescutellar bristles strong, as long as scutellum. Pleura pruinose; pro- and mesopleura brown in upper $\frac{1}{4}$ to $\frac{1}{3}$. Prosternum usually without hairs. Legs yellow to testaceous, front tibiae and tarsi brownish to black, mid and hind tibiae and tarsi less darkly pigmented, usually only tarsal segments 4 and 5 blackish. Wings hyaline, with dark brown reticulations; posterior crossvein curved outwardly, usually sinuate; halter yellow, brownish at apex. Wing lengths of 20 females 4.6 to 6.0 mm (average 5.4 mm), 20 males 4.0 to 5.4 mm (average 4.9 mm).

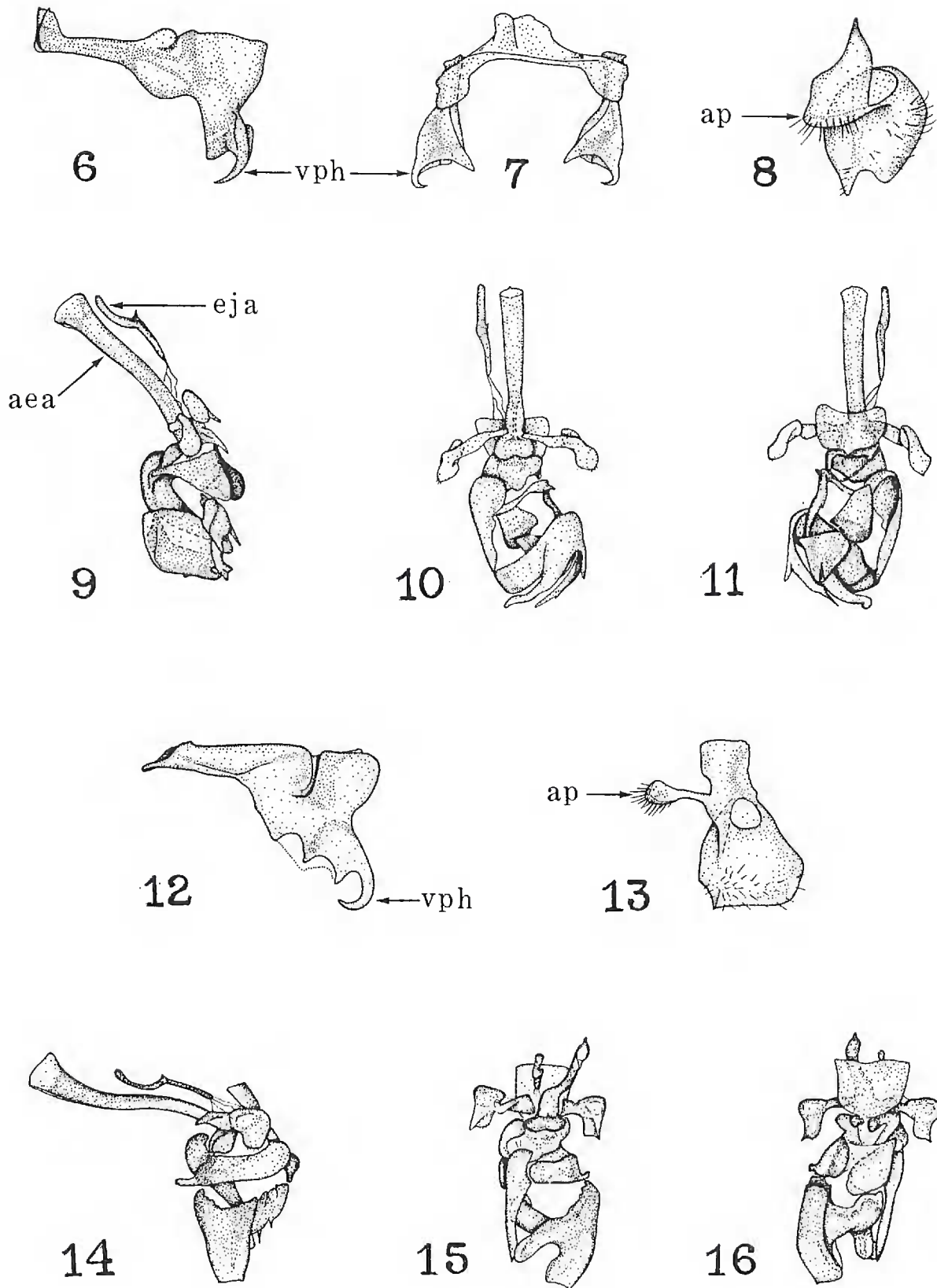
Abdomen pruinose with two lateral brown vittae on each side. Postabdomen as in Fig. 4.

KEY TO THE SPECIES OF CALIFORNIA LIMNIA

1. Brown marginal cell of wing with clear spots extending to costal margin; prosternum with hairs; frons wider than long; second antennal segment with 2 strong bristles on the anterior dorsal edge; prescutellar bristles approximately as long as scutellum. (Male terminalia as in Fig. 2) *boscii* (Rob.-Desv.)
- Brown marginal cell of wing without clear spots extending to costal margin; prosternum without hairs 2
2. Second antennal segment with 4 or more strong bristles on the anterior dorsal edge (Fig. 1) frons approximately as wide as long; prescutellar

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FIGS. 6-16. Figs 6-11. *Limnia inopa* (Adams). Diagnostic structures of post-abdomen. USA, Calif.; Modoc Co.; Cedar Pass Campground; Elev. 5,800 ft.; VIII-8-1968; T. W. Fisher and R. E. Orth, collectors. Legend: aea, aedeagus;



ap, anterior process; eja, ejaculatory apodeme; vph, ventral process of hypandrium. Fig. 6. Hypandrium, sinistral view. Fig. 7. Hypandrium. Fig. 8. Surstylus (left), sinistral view. Fig. 9. Aedeagus, sinistral view. Fig. 10. Aedeagus, posterior view. Fig. 11. Aedeagus, anterior view. Figs. 12-16. *Limnia severa* Cresson. Diagnostic structures of post abdomen. USA, Calif.; Inyo Co.; Lake Sabrina; Elev. 9,000 ft.; IX-6-1967; T. W. Fisher and R. E. Orth, collectors. Fig. 12. Hypandrium, sinistral view. Fig. 13. Surstylus (left), sinistral view. Fig. 14. Aedeagus, sinistral view. Fig. 15. Aedeagus (looking posterad). Fig. 16. Aedeagus (looking anterad).

- bristles approximately $\frac{1}{2}$ to $\frac{2}{3}$ as long as scutellum. (Male terminalia as in Fig. 5) *pubescens* (Day)
 Second antennal segment with 2 strong bristles on the anterior dorsal edge.
3. Frons approximately as wide as long; pre-scutellar bristles as long as scutellum. (Male terminalia as in Fig. 4) *severa* Cresson
 Frons distinctly longer than wide; prescutellar bristles variable, generally vestigial to $\frac{1}{2}$ length of scutellum (Male terminalia as in Fig. 3)
 *inopa* (Adams)

DISCUSSION

Of the 440 *Limnia* specimens we collected within the State between VI-10-1965 and VI-26-1974, approximately 80% were *L. severa*, 11% *pubescens*, 8% *inopa*, and less than 1% *boscii*. In the 76 collections made in California which contained *Limnia*, *L. severa* occurred alone at 29 sites, *L. inopa* alone at 6, *L. pubescens* alone at 3, and *L. boscii* alone at one. *Limnia severa* and *L. inopa* co-habited 3 sites; *severa* and *pubescens* co-habited one site. Three species, *inopa*, *pubescens*, *severa*, co-habited two sites, Bartle in Siskiyou Co., and Cayton, in Shasta Co. In 1973-1974 at Bartle, a large diverse habitat, *L. severa*, *L. pubescens*, and *L. inopa* represented 9%, 4%, and 4%, respectively, of the 13 sciomyzid species collected. In 1972, 1973, and 1974 at Cayton, a very restricted habitat, *L. pubescens*, *severa*, and *inopa* represented 55%, 19%, and 1%, respectively, of the 10 sciomyzid species collected. *Limnia boscii* was the only species of *Limnia* we collected at Fish Slough in Mono Co., 10 miles north of Bishop, and our records indicate that it occurs only at that locality within California.

Over the nine year period of collecting in California we found *Limnia* co-existing with a rather diverse sciomyzid fauna, i.e., 21 species. Allowing for repeated collections at certain of the sites this summary does not reflect seasonal population trends but was derived from 76 isolated points in time. On-site separative mechanisms such as time, space, plant associations, or proximity to water, are discernible. Two examples are; (1) *L. inopa* does not appear before mid-summer, and (2) repeated visits to the Hat Creek and Cayton sites yielded *L. pubescens* only at restricted areas of several square meters within the larger boundaries of those sites. This observation suggests that *L. pubescens* requires a rather special set of ecological parameters to exist at all, but when those requirements are met *pubescens* can exist in relatively large numbers.

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